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Citation for published version:

Collins, D & Carson, HJ 2017, 'The future for PETTLEP: a modern perspective on an effective and established tool', *Current Opinion in Psychology*, vol. 16, pp. 12-16.
<https://doi.org/10.1016/j.copsyc.2017.03.007>

Digital Object Identifier (DOI):

[10.1016/j.copsyc.2017.03.007](https://doi.org/10.1016/j.copsyc.2017.03.007)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Current Opinion in Psychology

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The future for PETTLEP: A modern perspective on an effective and established tool

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Abstract

Over the past 15 years there has been much research into the PETTTLEP model of motor imagery, originally designed to improve the quality and impact of imagery interventions on sport performance. This article reviews the most recent trends within this research. Despite a suggested change of underpinning mechanisms involved, there is much support for the positive impact of the model when applied within the sporting context and with engaged participants. The model also appears to have provided impact in fields other than sport, such as medicine and music. Therefore we suggest that it has largely met its desired aims. However, not all research has optimised the model's guidelines, with a distinct failure to account for personal relevance when designing imagery scripts or selecting tasks for use in studies. Other recent and pertinent findings relate to the mediating role of expectancy and beneficial augmentation through movement observation. Future research should, however, seek exploitation and clarification towards contemporary issues in motor control, namely; automaticity, the relative merits of internal and external foci and subconscious goal priming. Finally, we endorse the application of imagery, as a conscious intervention, even for execution of unconscious, fast-actions.

PETTLEP: Where it all started and why

In 2001, Holmes and Collins [1**] published the PETTLEP approach to motor imagery. Specifically designed to raise the quality and impact of imagery interventions on performance, the mnemonic was grounded in the concepts of functional equivalence, drawing heavily on the work of Peter Lang [e.g., 2*] and Marc Jeannerod [e.g., 3*]. The PETTLEP model or method suggested seven factors which should be catered for when designing imagery interventions; namely, Physical, Environment, Task, Timing, Learning, Emotion and Perspective (see [4*] for a detailed coverage of each). Catering for and individually tailoring as many of these factors as possible was proposed as a way to optimise the intervention outcome, due, at least as suggested by Holmes and Collins at the time, to maximising the functional equivalence of imaged and actual task execution.

More recently, the functional equivalence construct seems to have fallen out of fashion, with Wakefield, Smith, Moran and Holmes [5] attributing the model's positive impact to behavioural matching; representing a move from a neural to an experiential and/or phenomenological explanation. Whatever the underlying mechanism posited, however, the model seems to have met its original design, with a number of studies supporting the benefits of the approach [5] and the model now part of the *lingua franca* for many applied practitioners.

So what is the future for this method, designed originally as an applied tool? How well does the approach fit with other established and emerging constructs? What contribution, if any, can the method make to more fundamental research, either into related constructs or imagery itself? In this short review, we briefly consider the use and impact of the PETTLEP approach as shown by recent published findings. Following this, we explore some new directions for the construct, framed against other recent and relevant ideas from the

literature. We conclude by considering where PETTTLEP imagery, clearly a conscious process, may fit within the emerging conscious versus unconscious debate.

Application, Efficacy and Impact: A Critical Evaluation

From a process perspective, there is strong evidence for the impact of PETTTLEP on different aspects of the imagery experience [e.g., 6]. Of course, although of academic interest, this rather misses the point of why the method was specifically designed; namely, to enhance performance. As such, this situation offers another example of the clash between psychology *through, of or for* performance. Our point is that testing fundamental ideas in various domains, investigation and development of sport-specific theories and utilising principles and methods to benefit the performance of an individual or team are different purposes with consequently different needs [7]. In short, the tool should really be evaluated against the job which it was designed to do although, as we discuss later, applied tools may offer significant benefit to fundamental research.

In the 15 years of its history, there has been a steady stream of studies supporting the impact of PETTTLEP in applied interventions. Of those investigations which have shown equivocal results, several have actually acknowledged the misapplication of the tool (e.g., [8], with children on a skill test lacking in personal relevance). Notably, it is important to consider the dimension of personal relevance (seen as so important in Lang's original work [2], as a mediator of impact). In contrast, when PETTTLEP is used with committed athletes on tasks from their sport, effects seem more consistently positive (e.g., [9*]).

PETTTLEP has also been expanded successfully into other performance domains. The structure was used to good effect as the basis for a systematic review of imagery usage in rehabilitation [10]. It was also applied as a means to tweak intervention process and impact in music [11]. Its employment in medical protocols, for example in examining imagery effects in stroke patients [12], represents another impactful direction.

Another dimension which appears to mediate the impact of PETTTLEP interventions relates, unsurprisingly, to expectancy. For example, a penalty taking intervention in soccer was more effective with players who thought themselves capable of ‘peaking under pressure’ [13]. Expectancy increases associated with the individualisation achieved by the approach is also well supported, with research demonstrating the impact and improved performance which accrue from letting participants design their own stimulus scripts [14]. All these studies offer examples of where the approach serves to enhance performance, through either explicit application or employment of its underlying principles.

Certainly, even though the use of PETTTLEP is far from universal, there is still a steady stream of new studies which endorse elements of its approach. One recent example shows the advantages of combining movement with imagery (the Physical element) to enhance imagery vividness, quality and temporal congruence, as well as impact on performance [15]. PETTTLEP is also an effective adjunct to other techniques, for example its use in combination with video based observation [16*]. In summary, PETTTLEP is alive and fairly well. So where next for this potentially powerful construct?

New directions

Wakefield et al. [5] offer an excellent and informative critique of the original mechanisms proposed to underpin the PETTTLEP approach. We will not repeat their careful discussion here but rather summarise it as showing the construct of functional equivalence to be a good deal more complicated than Holmes and Collins’ [1] original work suggested. As a major consequence, it seems sensible to step back from the neuroscience-based original focus, moving towards something more practically grounded such as ‘function links’ [cf. 17]. Indeed, we would contend that this more ‘low tech’ approach may more accurately reflect the original authors’ objectives, or at least for one of them!

Such comments notwithstanding, there is a genuine need for future work to clarify contradictions and misapprehensions which inhibit greater cross-fertilisation between cognitive neuroscience and performance psychology [18]. There are several methods (e.g., PET and fMRI) which have been tested and shown promising results [e.g., 19,20]. From a mechanistic perspective, however, it is interesting to see how the application of new measures generates effects predicted by older research. For example, the identification and relevance of equivalences between imagery and physical execution on cortico-spinal excitability as shown by TMS [21]: an effect which seems to us to echo Lang's ideas of efference leakage. An earlier review by Loporto and colleagues [22] also offers relevant comparisons, all the focus of past examination, which may be achieved through the use of TMS including, 'hard' measures of imagery vividness, and levels of equivalence (our interpretation, not theirs) between movement observation, motor imagery and movement execution. Of course, given our backgrounds we are completely in favour of using such 'harder' and objective measures to more deeply probe the important imagery phenomenon. Against the backdrop of this paper, however, we would encourage researchers to look to the applied world, and copy well established techniques such as PETTLEP, so that the manipulations employed are as impactful as possible on participants. Furthermore, and reflecting earlier comments, it seems to us that the use of committed and involved participants, working with tasks that hold personal meaning, would also help matters. Finally, the use of triangulation between objective psychophysiological data and self-report would also aid clarity of interpretation. In simple terms, "back to the future" is often a useful strategy.

Another area for both exploitation and clarification is where imagery in general, and PETTLEP in particular, stands against other recent developments in performance psychology. Two of interest are the degree of automaticity in high level performance [23] and the relative

merits of an internal or external focus [24]. Demonstration of successful performance whilst focusing on “core” action components [25] and more familiar, self-selected internal foci [26] lead us to suggest the need for greater consideration towards the structure and establishment of motoric representations (e.g., [27,28]). In doing so there are important implications for the use of PETTTLEP as an integrated component of practice designed to optimise long-term skill acquisition. Certainly, as one example, it is important that athletes are able to regain control over their performances when dips occur and thinking about the right things, in the right way and at the right time will not be surprising advice to many effective performers and their coaches. Accordingly, the dynamic use of imagery based on its intended purpose would appear to conflict with the *universal* application of an external focus of attention (i.e., *not* thinking about the movement) so often presented to be the best solution [29]. Whilst debate about the universality of external focus continues (e.g., [24]), it is interesting to note the use of an imagery manipulation to examine the impact of attentional focus on skill acquisition. In an example of just the sort of integrated study we espouse, Sakurda et al. [30] used the Movement Imagery Questionnaire to divide participants into kinaesthetic and visually dominant imagers. These two groups evidenced significant differences in skill acquisition depending on directed attentional focus; kinaesthetic dominant participants benefitting most from the internal manipulation whilst visual dominance was associated with better performance with an external focus. In short, the external focus espoused as always the best was differentially impactful, depending on participant characteristics. Such research offers a great deal to both theory and practice. Once again, however, we would cheekily suggest the use of approaches such as PETTTLEP, with appropriate task–participant combinations, so that the impact of findings such as these may be optimised.

Certainly, another big factor for future consideration is the extent to which PETTTLEP may work to enhance physical performance of *novel* tasks; that is, tasks which represent a

movement as of yet not physically executed by that individual. In this regard, some of the literature is pessimistic, with Olsson and Nyberg [31] suggesting in a prestigious and careful review that “if you can’t do it, you won’t think it”. Notably, this work was situated heavily in the functional equivalence paradigm. Their suggestion stands in notable contrast to the practical applications of imagery however. The use of imagery to prepare for the execution of complex (and threatening) new skills is a central tenet of work in action sports such as freeskiing and snow-boarding (e.g., [32]) and also a major pillar of skill refinement [33**,34]; the fine adjustment of already learnt and internalised movements. For example, in the former, athletes were shown to employ *projective* imagery of themselves executing skills in combination with observations of other athletes that were capable of completing the skill. In the latter, Carson et al. [34] administered a best self-model to help shape the technique of a weightlifter over several weeks in combination with guided imagery practice. Kinematic data showed a continuous and gradual improvement towards the desired skill version. The importance of this process to many aspects of human endeavour (what movement activity does not include the need for tweaking and tuning?) shows the merit of such a line.

As a final example of integrating imagery with more recent constructs, ideas such as the Situated Inference Model [35] may be applied to see if the benefits can be enhanced by use of priming techniques. This approach, in tandem with other nonconscious priming tools such as goal priming [36] may offer another lease of life to a technique which has, to date, been held to operate through conscious mechanisms.

In Conclusion

We suggest that there is a clear role for PETTLEP driven imagery as an important tool for performance enhancement. We also see, however, that there is room for a lot more debate as to where it can and should not be used. For example, one might ask where imagery in general, and PETTLEP in particular, may sit in the conscious versus unconscious processing

debate; the challenge as to whether conscious processing is useful or debilitating in movement [37,38]. This is quite apart from the new and exciting idea of Type 0 cognition [39] which may have much to offer motor task performance. As a temporary fix to this conundrum, we would stress the role that slower, consciously driven rehearsal and internalisation can play in facilitating fast-action ‘unthinking’ reaction. The example of slower, off field work in team sports is one such example [40]. In other words, slower time mental rehearsal makes a powerful contribution to even the most fast-action, unconscious tasks. As most performance psychologists will attest, imagery is a big part of this. Accordingly, we are confident that the PETTLEP approach can continue to make a positive contribution, at least for another 15 years.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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** This article proposes that sport psychologists should consider more closely aspects of the performer's responses to the physical skill when providing imagery interventions. Therefore, a 7-point checklist (PETTTLEP model) of imagery delivery, highlighting the minimum requirement areas in which sport psychologists should monitor the equivalence to the physical task in order to enhance the efficacy of their practice, is presented. This checklist of motor imagery forms the basis of this review article.

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